UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Kedua
Sidang 1986/87

REW 224 - Perkhidmatan Kejuruteraan Bangunan dan Infrastruktur Fizikal I

Tarikh: 14 April 1987 Masa: 9.00 pagi - 12.00 t/hari
(3 Jam)

Sila pastikan bahawa kertas peperiksaan ini mengandungi EMPAT muka surat dan LIMA muka surat Lampiran yang tercetak sebelum anda memulakan peperiksaan ini.

Jawab LIMA soalan.

1. (a) Dengan menggunakan simbol-simbol antarabangsa untuk pemasangan elektrikal, tunjukkan dalam pelan rumah sebuah yang disertakan, kedudukan mata letrik berikut:-

(i) Papan agihan dan jangka

(ii) 13 buah punca lampu siling

(iii) 6 buah punca kuasa (5 ampiar)

(iv) 12 buah suis punca kuasa (13 ampiar)

(v) 3 buah suis punca kuasa untuk pendingin hawa (15A)

(vi) 1 buah suis punca kuasa untuk pemasak.

(b) Nyatakan peraturan-peraturan IEE (Regulations for Electrical Equipment of Buildings) bagi sistem pendawaian litar gelong untuk 13 ampiar suis punca kuasa di bangelo ini. (Pelan untuk rumah sebuah dilampirkan).

(20 markah)

2. Balai Perhimpunan di Sekolah Teknik 120' x 40' x 12' tinggi, akan dijadikan suatu Bilik Kuliah. Pencahayaannya akan dinaikkan dari 20 lm kakipersegi ke 40 lm kaki persegi. Sediakan satu sistem pencahayaan untuk membaikinya mengikut syarat-syarat IES. Gunakan alat-alat letrik yang sedia ada, iaitu lampu kelimantang kecekapannya 84% dengan rapat siling dan menggunakan tiub warna putih (lumen rekabentuknya 2750), 48" panjang dan 40 wat. Faktor senggaraan 70%, faktor pembalikan cahaya untuk siling 70% dan dinding 50%, tinggian satah kerja 32". Kirakan bilangan alat-alat yang akan ditambahkan.

Tunjukkan satu lakaran susunan sistem alat-alat tersebut.

(Jadual Faktor-Faktor Penggunaan Sekim Pencahayaan, dilampirkan).

(20 markah)

3. (a) Berkaitan dengan Akta Kilang dan Jentera 1967, terangkan istilah-istilah berikut:-

(i) Mesin lif

(ii) Lif barang-barang

(iii) "Dumbwaiter"

(b) Nyatakan aktiviti-aktiviti secara tertib dalam membina suatu pemasangan lif di Malaysia.

(20 markah)

4. (a) Mengikut Undang-Undang Kecil, Ordinan Perbandaran, Bahagian 6, Keperluan Api 1975, apakah syarat-syarat mengawal sistem kuasa letrik kecemasan bagi suatu kilang baju 5 tingkat.

(b) Dengan menggunakan lakaran rencanakan bekalan letrik kecemasan bagi sistem mencegah api untuk kilang ini.

(20 markah)

5. (a) Apakah tujuan-tujuan utama Kementerian Tenaga, Telekom dan Pos Malaysia untuk melaksanakan Undang-Undang Kecil Bangunan Seragam 1984 (Bahagian keperluan-keperluan kejimatan tenaga dalam bangunan-bangunan), berkaitan dengan pencahayaan?

(b) Nyatakan faktor-faktor yang anda perlu pertimbangkan untuk merekabentuk suatu sistem pencahayaan letrik.

(20 markah)

6. Sebutkan faktor-faktor yang anda mesti pertimbangkan apabila sebuah bangunan direka bagi pendingin hawa berkaitan dengan:-

(a) Pilihan sistem pendingin hawa dan

(b) Tertib aktiviti-aktiviti dalam rekabentuknya.

(20 markah)

7. (a) Mengikut Undang-Undang Kecil Ordinan Perbandaran, Bahagian 6, Keperluan Api, 1975, nyatakan sistem pemadam api dan sistem amaran api bagi sebuah padang letak kereta bawah-bumi luasnya 6000 kaki persegi.

(b) Berikan SATU lakaran berlebel bagi sistem pemadam api yang mesti digunakan padang letak kereta tersebut.
(Jadual 14, Ordinan Perbandaran, Bahagian 6, Keperluan Api, 1975 dikepilkan).

(20 markah)

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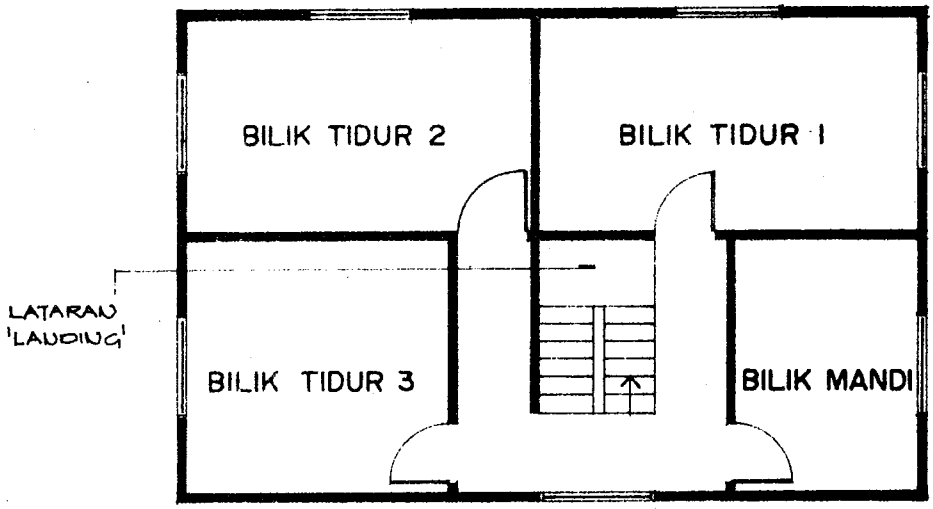
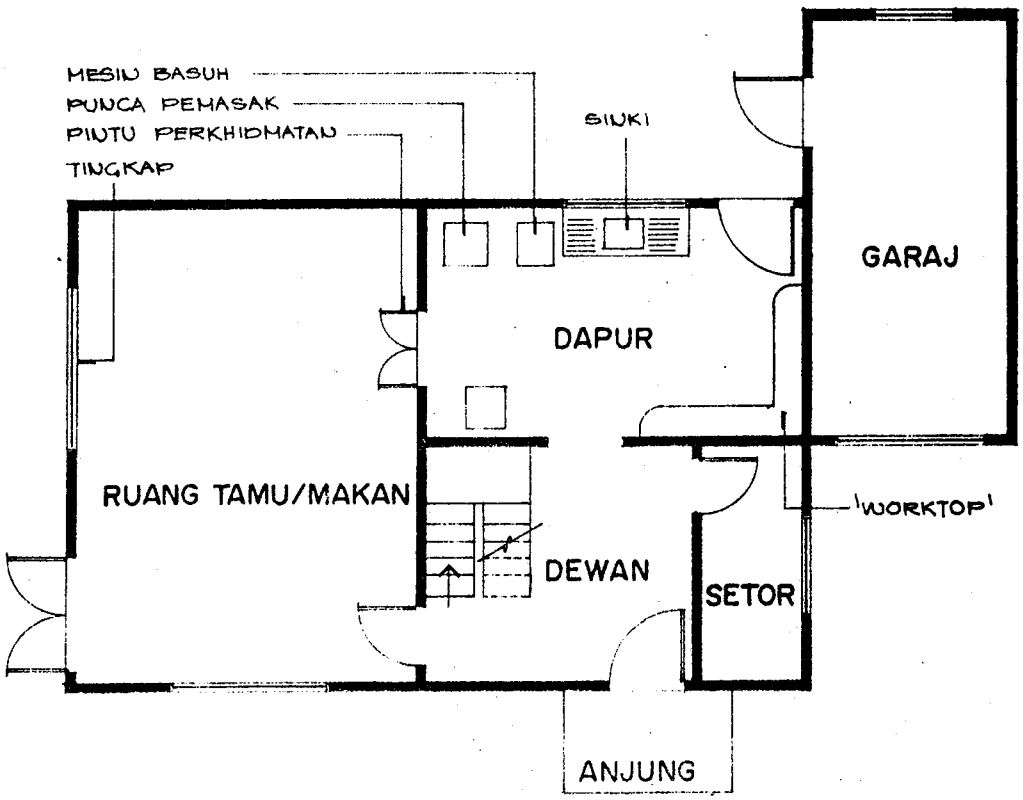
REW 224



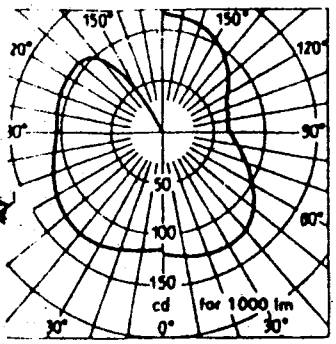
Tingkat Atas



Tingkat Bawah

PELAN SEBUAH RUMAH SEBUAH

Lampiran



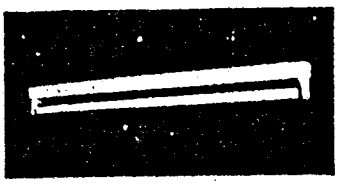
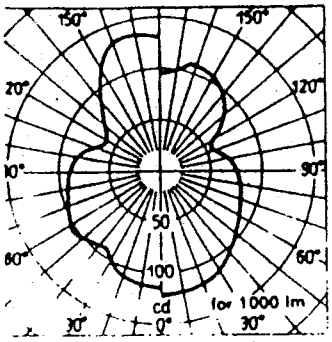


Fig. 19/18. Single-tube fluorescent-lamp fitting, 20 to 120 W, eff. 92%

Light distribution curve

left:	right:
1 lamp, mainly direct	2 lamps, direct



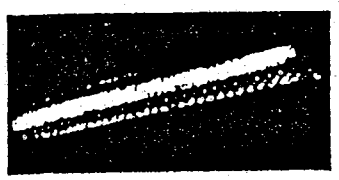


Fig. 19/19. Twin-tube fluorescent-lamp fitting with glass louvre, 40 to 120 W, eff. 84%, lamps arranged side by side

Light distribution curve

left:	right:
2 lamps	3 lamps

Uniform upward and downward radiation

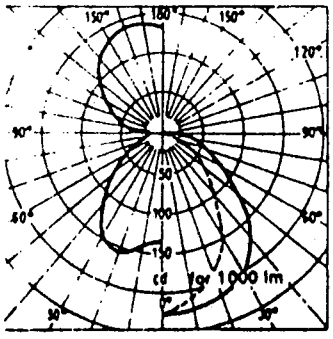


Fig. 19/20a. Rectangular fluorescent-lamp fitting with metal louvre, 40 to 120 W

Light distribution curve

left:	right:
Pendant lamp, upw. and downw. radiation, eff. 84%	Ceiling-mounted, downward radiation, eff. 55%

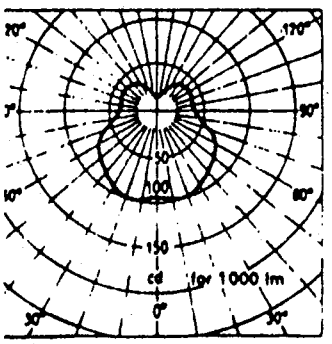


Fig. 19/20b. Ceiling fixture with acrylic trough for 20 to 65 W fluorescent lamps eff. 60%
Light distribution curve mainly direct

Table 19/11. FAKTOR-FAKTOR PENGGUNAAN SEKIM PENCAHAYAAN

Room index k	Reflection factor Ceiling 70%	Wall 50%	Ceiling 50%	Wall 50%	Ceiling 30%	Wall 10%
AEG reflector fittings, direct narrow angle, Fig. 19/18 (efficiency 80%), for h.p.m.v., mixed-light and incandescent lamps						
5	0.72		0.68		0.66	
3	0.66		0.65		0.61	
2	0.59		0.61		0.56	
1.25	0.52		0.53		0.48	
0.8	0.42		0.44		0.40	
AEG strip lighting fittings, mainly with direct free radiation, Fig. 19/18 (efficiency 92%)						
5	0.65		0.58		0.50	
3	0.59		0.52		0.44	
2	0.52		0.50		0.40	
1.25	0.44		0.41		0.32	
0.8	0.36		0.32		0.26	
AEG lighting fittings with uniform upward and downward distribution, glass louvre, Fig. 19/19 (efficiency 84%)						
5	0.60		0.53		0.46	
3	0.54		0.48		0.40	
2	0.48		0.45		0.36	
1.25	0.40		0.38		0.29	
0.8	0.32		0.29		0.23	
AEG strip lighting fittings with metal louvre, uniform upward and downward distribution, Fig. 19/20a (efficiency 70%)						
5	0.50		0.44		0.38	
3	0.45		0.40		0.34	
2	0.40		0.38		0.30	
1.25	0.34		0.32		0.25	
0.8	0.27		0.26		0.19	
AEG Acrylic-trough ceiling fittings, mainly direct radiation, Fig. 19/20b (efficiency 60%)						
5	0.46		0.44		0.40	
3	0.42		0.41		0.36	
2	0.36		0.38		0.32	
1.25	0.33		0.32		0.27	
0.8	0.26		0.26		0.21	

Direct illumination through louvres

Room index	Matt-white louvre	Glossy-white louvre	
5	0.30	0.40	An even illumination requires a distance between light source and louvre equal to two-thirds of the distance between two lamps.
2	0.25	0.35	
0.8	0.20	0.25	

P.U. (A) 180.

FOURTEENTH SCHEDULE

TABLE OF REQUIREMENTS FOR FIRE EXTINGUISHMENT SYSTEM, ALARM SYSTEMS AND ILLUMINATION OF MEANS OF EGRESS

	Occupancy Hazard	Extinguishing System Note 2	Fire Alarm System Note 3	Illumination of Means of Egress Control Unit	
				Voltage	Lamp Wattage
1.	PLACES OF ASSEMBLY				
1.1	Class A and B below the level of exit discharge	A and G	2	normal	25
1.2	Stage with fly galleries gridirons and riggings for moveable theatre-type scenery	A and G	2	normal	25
1.3	Hazardous Areas	A, B, C, D, E or F	—	—	—
2.	UNDERGROUND STRUCTURES AND WINDOWLESS BUILDINGS	G and H	1 and 2	—	—
3.	EDUCATIONAL OCCUPANCIES	G	4	normal	40
4.	INDUSTRIAL BUILDINGS				
4.1	Single storey exceeding 7,500 sq. ft.	G and H	2	—	—
4.2	Two storeys where the first floor exceeds 5,000 sq. ft	G and H	2	normal	40
4.3	More than two storeys or exceeding 250,000 cubic feet	A and G	2	—	—
4.4	Hazardous processes or storage	A, B, C, D, E or F	2	—	—
5.	MERCANTILE OCCUPANCIES				
5.1	Class A and B	A and G	2 and 3	normal	40
5.2	Combined Mercantile and Hotel Occupancies	A and G	2 and 3	24	25
5.3	Mercantile Occupancies below Hotel Occupancies	A and G	2 and 3	normal	40
5.4	Shopping malls	A and G	2	normal	40
6.	OFFICES AND BANKS EXCEEDING 60 FEET IN HEIGHT OR 100,000 SQUARE FEET GROSS AREA	G	1 and 2	24	8 flourescent
7.	HOSPITAL OVER 4 STOREYS	—	—	—	—
7.1	Hospitals and Nursing Homes	G and H	1, 2 and 3	normal	40
7.2	Residential and/or Custodial Care	G and H	1, 2 and 3	24	8 flourescent
8.	HOTELS				
8.1	Hotels exceeding 50 rooms—				
	rooms and general area	G	1, 2 and 3	24	25
	public areas	A and G	2 and 3	normal	25
8.2	Hotels exceeding 60 feet in height	A and G	2 and 3	24	25

	Occupancy Hazard	Extinguishing System Note 2	Fire Alarm System Note 3	Illumination of Means of Egress Control Unit	
				Voltage	Lamp Wattage
8.3	Hotels above Mercantile or Office Occupancies	G	1	normal	40
9.	MULTI-STOREY FLATS EXCEEDING 60 FEET IN HEIGHT OTHER THAN BALCONY-APPROACH TYPE	—	—	24	8 flourescent
10.	STORAGE AREAS				
10.1	Basements and underground garages	G	2	—	—
10.2	Basement garages and carparks exceeding 5,000 square feet	A and G	2	normal	40
10.3	Multi-storeyed carparks ..	G and H	2	normal	40
10.4	Automated Warehouses and high stack warehouses	A, B, C or F	2	—	—
10.5	Godowns and Warehouses over 2 storeys in height	A, C or F	2	normal	40
10.6	Basements in non-residential buildings (except strong rooms, safe deposits of banks) exceeding 5,000 sq. ft.	A or C	2	—	—
11.	LABORATORIES	D, E or F	1 and 2	normal	40
12.	COMPUTORS AND ELECTRONIC EQUIPMENT SUSCEPTIBLE TO DAMAGE BY FIRE, HEAT OR SMOKE	F	1	—	—
13.	AIR CONDITIONING SYSTEMS (RETURN AIR DUCT, LIFT SHAFTS, SERVICE SHAFTS, LINEN CHUTES)			—	—
	For buildings exceeding 60 feet	A	1	—	—

NOTE 1. The hazardous areas and processes within any building are the following areas—

(*a*) Boiler Room and Associated Fuel Storage spaces.

(*b*) Laundries.

(*c*) Repair Shops.

(*d*) Room or spaces used for storage in quantities materials deemed hazardous.

(*e*) Kitchen.

(*f*) Soiled Linen Room.

(*g*) Transformers and sub-stations.

(*h*) Plant Room.

(*i*) Flammable liquid processing or refining operations.

(*j*) Indoor Storage of flammable liquids.

(*k*) Chemical plants, solvent extraction plants, distillation plants, refineries.

(*l*) Process equipment, pump rooms, open tanks, diptanks, mixing tanks.

NOTE 2. The letters in the second column of this Appendix refer to the types of fixed extinguishing system, as follows—

A—Automatic Sprinklers

B—Water spray system.

C—High Expansion Foam System.

D—Carbon-dioxide system.

E—Approved Halogenated Extinguishing System.

F—Other Automatic Extinguishing System.

G—Hose Reel.

H—Hydrant System.

NOTE 3. The figures in the third column of this Appendix refer to the types of fire alarm, as follows—

1—Automatic Fire Detectors System.

2—Manual Electrical Fire Alarm System.

3—Signal Indicator Alarm System.

4—Manual Alarm System.

NOTE 4. Types of Emergency Illumination—

(*a*) Signal point units.

(*b*) Central Battery.

(*c*) Generators.

In all cases the duration of emergency illumination in the event of failure of normal supply shall not be less than 1 hour.

FIFTEENTH SCHEDULE

STANDARD SCALE FOR MAINS WATER SUPPLY FOR INSTALLATION OF FIRE HYDRANTS

ALL NEW AND RESITED FIRE HYDRANTS SHALL BE DOUBLE-FILLER STAND POST TYPE

Risk Category	Average Output per Fire Hydrant	Spacing of Fire Hydrants	Total number of Fire Hydrants in area of risk likely to be employed simultaneously in major fires
Class A . .	300/400 gpm	300 feet	4—6
Class B . .	250/300 gpm	400 feet	3—5
Class C . .	250/300 gpm	450 feet	3—4
Class D . .	180/220 gpm	450 feet	1—2
Class E . .	180/220 gpm	600 feet	1
Special High Risk . .	300/400 gpm	300 feet Max	6